

AMENDMENTS TO THE CLAIMS

Please cancel claims 2-4 and 6-7, amend claims 1 and 5 and add claims 16-29, as set forth in the following listing of claims, which will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. (Currently Amended) A humidifier for fuel cell comprising:

a hollow fiber membrane module having a hollow fiber membrane bundle, comprising a plurality of hollow fiber membranes bundled together, and a housing which accommodates the hollow fiber membrane bundle, the hollow fiber membrane module feeding a reactive gas, which is to be supplied to a fuel cell, inside the housing and outside the hollow fiber membranes, and feeding off-gas, exhausted from the fuel cell, into the hollow fiber membranes, thereby transferring water in the off-gas via the hollow fiber membranes to the reactive gas and humidifying the reactive gas;

an off-gas flow entrance which the off-gas flows through into the hollow fiber membrane, the off-gas flow entrance being provided in one end of the hollow fiber membrane module; ~~and~~

a liquid exhaust mechanism which exhausts liquid, which has been generated from the off-gas flowing through the off-gas flow entrance; and

a water blockage detecting unit which detects water blockage of the hollow fiber membrane in the off-gas flow entrance.

wherein the liquid exhaust mechanism is controlled in accordance with a detection result of the water blockage detecting unit. is provided below the off-gas flow entrance, and is separate from reactive gas exits from which the reactive gas is exhausted from the humidifier.

2-4. (Canceled)

5. (Currently Amended) A humidifier for fuel cell comprising:

a hollow fiber membrane module having a hollow fiber membrane bundle, comprising a plurality of hollow fiber membranes bundled together, and a housing which accommodates the hollow fiber membrane bundle, the hollow fiber membrane module feeding off-gas, exhausted

from a fuel cell, inside the housing and outside the hollow fiber membranes, and feeding a reactive gas to be supplied to the fuel cell into the hollow fiber membranes, thereby transferring water in the off-gas via the hollow fiber membranes to the reactive gas and humidifying the reactive gas;

a supply gas flow exit through which the reactive gas is exhausted from inside the hollow fiber membranes, the supply gas flow exit being provided in one end of the hollow fiber membrane module; and

a liquid exhaust mechanism which exhausts liquid, which has been generated from the reactive gas fed through the supply gas flow exit;

a water level sensor, which detects accumulation of water in the supply gas feed exit; and
a controller, which uses the liquid exhaust mechanism to exhaust the water when the water level sensor has detected that water is accumulating,

wherein the liquid exhaust mechanism is provided below the supply gas flow exit, and is separate from off-gas exits from which the off-gas is exhausted from the humidifier.

6-11. (Canceled)

12. (Previously Presented) A humidifier for fuel cell according to claim 1, further comprising a controller which controls the liquid exhaust mechanism in accordance with the humidification status of the fuel cell.

13. (Previously Presented) A humidifier for fuel cell according to claim 5, further comprising a controller which controls the liquid exhaust mechanism in accordance with the humidification status of the fuel cell.

14. (Previously Presented) A humidifier for fuel cell according to Claim 1, wherein the liquid exhaust mechanism comprises at least one drainage hole provided below the off-gas flow entrance.

15. (Previously Presented) A humidifier for fuel cell according to Claim 5, wherein the liquid exhaust mechanism comprises at least one drainage hole provided below the supply gas flow exit.

16. (NEW) A humidifier for fuel cell according to Claim 5, further comprising a storing unit which stores the exhausted liquid, and a supplementary humidification unit which performs supplemental humidification of the reactive gas by using the liquid stored in the storing unit.

17. (NEW) A humidifier for fuel cell comprising:

a hollow fiber membrane module having a hollow fiber membrane bundle, comprising a plurality of hollow fiber membranes bundled together, and a housing which accommodates the hollow fiber membrane bundle, the hollow fiber membrane module feeding a reactive gas, which is to be supplied to a fuel cell, inside the housing and outside the hollow fiber membranes, and feeding off-gas, exhausted from the fuel cell, into the hollow fiber membranes, thereby transferring water in the off-gas via the hollow fiber membranes to the reactive gas and humidifying the reactive gas;

an off-gas flow entrance which the off-gas flows through into the hollow fiber membrane, the off-gas flow entrance being provided in one end of the hollow fiber membrane module;

a liquid exhaust mechanism which exhausts liquid, which has been generated from the off-gas flowing through the off-gas flow entrance;

a storing unit which stores the exhausted liquid; and

a supplementary humidification unit which performs supplemental humidification of the reactive gas by using the liquid stored in the storing unit,

wherein the liquid exhaust mechanism is provided below the off-gas flow entrance, and is separate from reactive gas exits from which the reactive gas is exhausted from the humidifier.

18. (NEW) A humidifier for fuel cell according to Claim 17, wherein the liquid exhaust mechanism comprises at least one drainage hole provided below the off-gas flow entrance.

19. (NEW) A humidifier for fuel cell comprising:

a hollow fiber membrane module having a hollow fiber membrane bundle, comprising a plurality of hollow fiber membranes bundled together, and a housing which accommodates the hollow fiber membrane bundle, the hollow fiber membrane module feeding a reactive gas, which is to be supplied to a fuel cell, inside the housing and outside the hollow fiber membranes, and feeding off-gas, exhausted from the fuel cell, into the hollow fiber membranes, thereby transferring water in the off-gas via the hollow fiber membranes to the reactive gas and humidifying the reactive gas;

an off-gas flow entrance which the off-gas flows through into the hollow fiber membrane, the off-gas flow entrance being provided in one end of the hollow fiber membrane module;

a liquid exhaust mechanism which exhausts liquid, which has been generated from the off-gas flowing through the off-gas flow entrance;

an output power detecting unit, which detects an output power of the fuel cell; and

a controller, which uses the liquid exhaust mechanism to exhaust the liquid when the output power detected by the output power detecting unit is below a predetermined value,

wherein the liquid exhaust mechanism is provided below the off-gas flow entrance, and is separate from reactive gas exits from which the reactive gas is exhausted from the humidifier.

20. (NEW) A humidifier for fuel cell according to Claim 19 wherein the liquid exhaust mechanism comprises at least one drainage hole provided below the off-gas flow entrance.

21. (NEW) A humidifier for fuel cell comprising:

a hollow fiber membrane module having a hollow fiber membrane bundle, comprising a plurality of hollow fiber membranes bundled together, and a housing which accommodates the hollow fiber membrane bundle, the hollow fiber membrane module feeding a reactive gas, which is to be supplied to a fuel cell, inside the housing and outside the hollow fiber membranes, and feeding off-gas, exhausted from the fuel cell, into the hollow fiber membranes, thereby transferring water in the off-gas via the hollow fiber membranes to the reactive gas and humidifying the reactive gas;

an off-gas flow entrance which the off-gas flows through into the hollow fiber membrane, the off-gas flow entrance being provided in one end of the hollow fiber membrane module;

a liquid exhaust mechanism which exhausts liquid, which has been generated from the off-gas flowing through the off-gas flow entrance; and

a controller which controls the liquid exhaust mechanism in accordance with the humidification status of the fuel cell,

wherein the liquid exhaust mechanism is provided below the off-gas flow entrance, and is separate from reactive gas exits from which the reactive gas is exhausted from the humidifier.

22. (NEW) A humidifier for fuel cell according to Claim 21, wherein the liquid exhaust mechanism comprises at least one drainage hole provided below the off-gas flow entrance.

23. (NEW) A humidifier for fuel cell according to Claim 21, further comprising a storing unit which stores the exhausted liquid, and a supplementary humidification unit which performs supplemental humidification of the reactive gas by using the liquid stored in the storing unit.

24. (NEW) A humidifier for fuel cell comprising:

a hollow fiber membrane module having a hollow fiber membrane bundle, comprising a plurality of hollow fiber membranes bundled together, and a housing which accommodates the hollow fiber membrane bundle, the hollow fiber membrane module feeding off-gas, exhausted from a fuel cell, inside the housing and outside the hollow fiber membranes, and feeding a reactive gas to be supplied to the fuel cell into the hollow fiber membranes, thereby transferring water in the off-gas via the hollow fiber membranes to the reactive gas and humidifying the reactive gas;

a supply gas flow exit through which the reactive gas is exhausted from inside the hollow fiber membranes, the supply gas flow exit being provided in one end of the hollow fiber membrane module;

a liquid exhaust mechanism which exhausts liquid, which has been generated from the reactive gas fed through the supply gas flow exit;

an output power detecting unit, which detects an output power of the fuel cell; and

a controller, which uses the liquid exhaust mechanism to exhaust the liquid when the output power detected by the output power detecting unit is below a predetermined value

wherein the liquid exhaust mechanism is provided below the supply gas flow exit, and is separate from off-gas exits from which the off-gas is exhausted from the humidifier.

25. (NEW) A humidifier for fuel cell according to Claim 24, wherein the liquid exhaust mechanism comprises at least one drainage hole provided below the off-gas flow entrance.

26. (NEW) A humidifier for fuel cell according to Claim 24, further comprising a storing unit which stores the exhausted liquid, and a supplementary humidification unit which performs supplemental humidification of the reactive gas by using the liquid stored in the storing unit.

27. (NEW) A humidifier for fuel cell comprising:

a hollow fiber membrane module having a hollow fiber membrane bundle, comprising a plurality of hollow fiber membranes bundled together, and a housing which accommodates the hollow fiber membrane bundle, the hollow fiber membrane module feeding off-gas, exhausted from a fuel cell, inside the housing and outside the hollow fiber membranes, and feeding a reactive gas to be supplied to the fuel cell into the hollow fiber membranes, thereby transferring water in the off-gas via the hollow fiber membranes to the reactive gas and humidifying the reactive gas;

a supply gas flow exit through which the reactive gas is exhausted from inside the hollow fiber membranes, the supply gas flow exit being provided in one end of the hollow fiber membrane module;

a liquid exhaust mechanism which exhausts liquid, which has been generated from the reactive gas fed through the supply gas flow exit; and

a controller which controls the liquid exhaust mechanism in accordance with the humidification status of the fuel cell,

wherein the liquid exhaust mechanism is provided below the supply gas flow exit, and is separate from off-gas exits from which the off-gas is exhausted from the humidifier.

28. (NEW) A humidifier for fuel cell according to Claim 27, wherein the liquid exhaust mechanism comprises at least one drainage hole provided below the off-gas flow entrance.

29. (NEW) A humidifier for fuel cell according to Claim 27, further comprising a storing unit which stores the exhausted liquid, and a supplementary humidification unit which performs supplemental humidification of the reactive gas by using the liquid stored in the storing unit.